AGRICULTURAL NEWS LETTER

VOL. 26 No. 4 FALL 1958

This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

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THE AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and ideas in agriculture, particularly those related to advancements through research. Material herein may be reprinted, in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

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Many a farm owner now finds it necessary to scratch a sun-bronzed scalp late at night over social security tax forms, in addition to the long-established routine of keeping records for state and federal income tax returns. While his children are rounding up mavericks and staving off rustlers on a dozen TV ranches, the farmer is trying to keep track of income and outgo and compute tax liabilities according to laws that seem to increase in complexity every year. Most farm owners will likely agree that the ancient burden of taxes can be partly measured by the increasing chore of keeping the books and carrying the cash to the government revenue office.

For a corporation like Du Pont, the task of computing, collecting, and conveying tax money is a costly one and reflects the increasing labyrinth of our tax structure. Lawyers and accountants must interpret hundreds of tax laws and file thousands of tax reports. At its Wilmington headquarters alone, 69 Du Pont employees are directly involved in preparing tax problems and reports. The largest unit, handling the many business taxes levied on Du Pont operations, reports to 85 taxing jurisdictions, and files 1200 tax reports yearly.

A much larger number of reports are required by withholding taxes on payrolls — more than a quarter million each year. More than 156,000 withholding statements are also prepared for employees. In addition, 33 government units required 91,000 informational returns reporting dividends paid stockholders.

In order to pay state and local property taxes to 825 government units in 47 states, Du Pont must file more than 600 reports and make out 825 checks each year.

While the farm owner may not hire a staff of lawyers and bookkeepers, he probably averages several hours a month on records necessary to meet the requirement of tax laws. In doing so, he learns intimately the ever present truth that every new tax adds a new floor to the expense of running his farm, and reduces the margin between his total costs and the prices his goods will bring on the market.

For the corporation too, the effort incurred in collecting, computing, and delivering tax monies to various government units serves as an index of the burden of taxes on business output. Like buying materials and services, paying wages and salaries, repairing machines, and painting buildings, taxes are always a part of the cost of doing business which must of necessity show up in the price of products.

As a corporate citizen, Du Pont has no wish to shirk its responsibility to government and public welfare. It is obvious, however, that any means of minimizing the tax load would have the good effect of making most products available to customers at a lower price.

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CHEMICAL WEED CONTROL for FIRELANES AND PULPWOOD AREAS

Chemical herbicides may mean substantial savings in time and money for fire control measures, according to studies made in forest firelanes and pulpwood storage yards in Wisconsin, Minnesota, and Michigan. Vigorous growth of grass and weeds is a serious fire hazard, especially before new growth in the spring and during the dry period in late summer and early fall. Mechanical control, such as mowing, disking or digging, produces temporary results, but actually tills the ground for more vegetation, and late summer rainfall may bring more growth than ever.

Firelanes

Firelanes generally intersect both natural and planted pulpwood stands at approximately one-half mile intervals. They are used as both firebreaks and access roads and are normally 12 feet wide. Their value for fire prevention is lost if weed growth gives fire a free cross passage. Firelanes have been kept temporarily free of growth by mechanical disking at an annual cost of some $25 per acre.

Since 1950, J. E. Kuntz and A. J. Riker of the University of Wisconsin have been testing herbicides, especially long-lasting "soil sterilants," in search of better and cheaper means of weed control.*

These tests indicate that up to five years' control of most annual weeds can be obtained with monuron or diuron. At 20 to 40 pounds per acre, annual cost over the five-years was $12 to $16 per acre.†

As pointed out by these investigators, "there is little question concerning the relative ease and speed with which chemicals can be applied as compared with slow and laborious mechanical methods. If the initial cost of chemicals can be pro-rated over several years of residual effect, then practical applications seem close at hand."

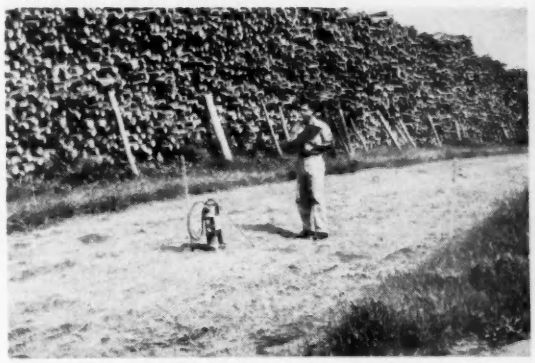
Pulpwood Storage Yards

Tests in pulpwood storage yards began in 1953 under the direction of Drs. Kuntz and Riker. Considerable decayed wood waste and humus had accumulated there over a period of years. Since the yards were usually located adjacent to rivers, dams, or ponds, soils were often moist, and weed growth dense. Diuron (at 45 and 60 pounds per acre) was the only chemical tested giving good initial control and little regrowth after three years.

The Northwest Paper Company, Cloquet, Minn., started weed control trials in its storage yards in 1954. Results were successful, and they embarked on a long-range weed control program in 1955, using monuron at 40 pounds per acre. Control from the initial treatment has extended into the third season — making an annual chemical cost of $40 per acre, plus the cost of application. Similar results were obtained with diuron by the Nekoosa-Edwards Paper Co., Port Edwards, Wisc.

Details of this work have been reported in Research Reports of the North Central Weed Control Conference 1950-56, and the University of Wisconsin Forest Research Notes.

†*Du Pont manufactures "Telvar"W weed killer, containing monuron, and "Telvar"DW, containing diuron.*



TEST PLOT in pulpwood area continues growth free in the second season after spraying with "Telvar" DW weed killer.

PORTION OF forest road treated with herbicide is free of undesirable growth 18 months after application of the chemical.

industry creates economic opportunities in farm areas

It has long been recognized that a solution of farm employment and income problems — especially for small, low-income farms — cannot be achieved entirely within the agricultural economy. In recent years, there has been a decided trend of industry to non-metropolitan areas, with the result that levels of income have generally been raised and other factors of the local economy of these areas have been greatly stimulated.

Industrialization has also provided a means of stemming some of the out-migration in low-income areas. The expansion of industry into rural areas is indicated by the recent Du Pont plant construction at such locations as Tecumseh, Kans., Brevard, N. C., Circleville, O., and Antioch, Calif.

Farms Generally Small

A study by the Louisiana State University* provides a significant picture of the influence of industrial development on the "levels of living and social participation" of people employed in a recently opened plant within a rural area. Findings are based on a 40-per-cent random sample of the plant's 500 employees.

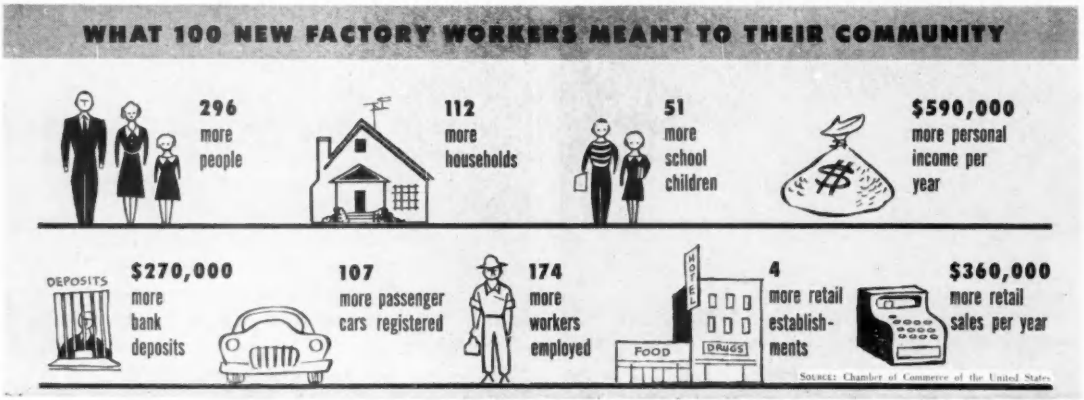
Two-thirds of the employees live in the open country, the greater number on farms (35 per cent). The farms are generally small; more than half are less than 25 acres. Farm income was found to be low, with total value of product sold in 1956 being less than $1,000 on over half the farms from which the employees came. One-fifth of the farm sales were less than $250. By comparison, the average value of farm product sold in the area for 1954 was $4,000.

The employees in the Louisiana study were largely unskilled and semi-skilled. Their median level of schooling was only seven grades, and only one per cent had training beyond high school. Wages received were generally near the minimum, with three-fourths getting from $35 to $44 per week.

Levels of Living Rose

The study found that "levels of living of the plant employees have risen significantly," and the majority feel that "the factory has increased their chances to get ahead." Most of the farming employees "are enthusiastic toward plant employment. The most commonly mentioned advantage of factory over farm work was more regular pay."

*PRICE, PAUL H., BERTRAND, ALVIN L., OSBORNE, HAROLD W.: "The Effects of Industrialization on Rural Louisiana: A Study of Plant Employees," Louisiana Agricultural Experiment Station, Louisiana State University, and Agricultural Marketing Service, USDA, January, 1958.


WHAT 100 NEW FACTORY WORKERS MEANT TO THEIR COMMUNITY
296 more people
112 more households
51 more school children
$590,000 more personal income per year
DEPOSITS
$270,000 more bank deposits
107 more passenger cars registered
174 more workers employed
FOOD
DRUGS
4 more retail establishments
$360,000 more retail sales per year
Source: Chamber of Commerce of the United States

A study was also made by the Mississippi Experiment Station† to "show what industrialization can do for incomes of rural families" living near industrial cities. It was found that "industrialization had helped a number of low-income families . . . In fact, the majority of the families sampled depended on off-farm work for livelihood." Operators on 68 per cent of the part-time farms in the sample surveyed had earnings "five times greater" from off-farm work than from the farm.

The study also points out that full-time farm families "should benefit two ways" from the industrial development: (1) Increased markets and (2) formation of larger farms and release of land from farmers going into industry.

Additional Jobs Created

Additional information on the importance of rising industrial employment is contained in a study by the U. S. Chamber of Commerce in nine counties that have shown significant rise in manufacturing employment between 1940 and 1950.§ None of the counties adjoins a metropolitan area.

It was found that for every 100 new factory employees, 109 additional jobs were created locally and 35 jobs disappeared, or a net gain of 74. The gains included 33 people in retail trade, 25 in construction, 14 in professional and related services, 13 in transportation and public utilities, and 24 miscellaneous. Nearly 89 per cent of the 35 jobs eliminated was in agriculture.

Increased Sales

The impact of industrial growth was not, of course, limited to employment. The local small businesses gained substantially from the influx of wages, company purchases, and other factors. For each 100 new factory employees, grocery stores increased sales by $70,000 per year, eating and drinking places by $30,000, department, dry goods, and variety stores by $45,000, automobile dealers by $50,000. The total retail gain was $360,000. Personal Income increased $590,000 annually, bank deposits went up $270,000, and passenger car registration rose by 107.

The effect is not, of course, confined to the locality, since many of the goods and services required must come from other parts of the country. It has been estimated that one million new jobs increase the nation's flow of goods and services by $8 billion.

Contribution to Purchasing Power

The contribution of large industrial plants is illustrated by the experience of Du Pont. For example, the company's three plants in Salem and Gloucester Counties, N. J., in 1956 contributed $85 million in purchasing power, including nearly $59 million in pay to 9,000 employees and over $27 million in plant purchases from over 1,800 companies in the state. Du Pont plants in New Jersey add up to nearly $140 million in payrolls and purchases. In New York, Du Pont plants generated $62 million in purchasing power, with $35 million in wages and salaries to 5,900 people, and $27 million in materials and services purchased.

†*Mississippi Farm Research, April,* 1958, *Agricultural Experiment Station, Mississippi State College.*

§*Chamber of Commerce of the United States: "What New Industrial Jobs Mean to a Community," Washington,* 1957.

DU PONT LAUNCHES SECOND SEASON OF "SHOW OF THE MONTH"

The Pulitzer-prize comedy "Harvey" will open the second season of the Du Pont "Show of the Month," September 22, 9:30 p. m., EDT, over the CBS television network. Art Carney and Marion Lorne will have starring roles.

This is the 23rd year of Du Pont's radio and television broadcast activity and the second year of the "Show of the Month," consisting of "live" 90-minute productions based on important works of literature, drama, or the Broadway stage.

Tentatively scheduled for showing are "The Count of Monte Cristo" (October 28, 7:30), "Victory" (November 13, 9:30), "The Little World of Don Camillo" (December 18, 7:30), "What Every Woman Knows" (January 28, 9:30), and "Hamlet" (February 24, 9:30).

During the past season, Du Pont's "Show" achieved an average audience level of 35 million, with two shows reaching 46 million viewers. Over 80 per cent of all TV homes with television in the U. S. saw one or more of the "Show" programs and 56 per cent, three or more.

life in a new world

GERM-FREE ANIMALS IN BIOLOGIC RESEARCH

by D. C. BOUGHTON, Ph. D.
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E. I. du Pont de Nemours & Co. (Inc.)

While physical scientists are looking into outer space for new worlds, small groups of biologists have created a "new world" on earth for research with animals — a germ-free world. Vertebrate animals are born into a sterile environment and kept free of bacterial and parasitic infection, providing a "pure" organism for study.

When birds and animals appeared on earth, they found it teeming with lower forms of life, some of which — bacteria and tapeworms, for instance — readily accepted the newcomers as convenient hosts. For millions of years, it has been the fate of every animal to give shelter, warmth, and nourishment to parasites. From the first breath, the newborn animal is contaminated, maturing into a "biologic complex of animal and miscellaneous bacteria."

Many Animals Raised

So intimately has the parasite become a part of the organism, that the concept of germ-free animals grew out of the dispute over Pasteur's contention that germ-free life was not possible. His opinion was proved wrong, and by 1915, work in this field came to a temporary halt.

The first long-range program for the study of germ-free life was undertaken in 1928 at Notre Dame University, motivated by the thesis that the "pure" culture concept of the bacteriologist could be usefully extended into medicine and biology. Many animals, including monkeys, dogs, rabbits, and chickens, have been raised and bred in germ-free mechanical systems which have been developed. Studies with germ-free vertebrates included such problems as growth effects of antibiotics, vitamin interrelationships, origin of tumors, dental caries, and radiation sickness.

The cost and complexity of germ-free studies have restricted some of the applications of this technique in the past. Potentially, this is a tool of broad application into many fields affecting animal husbandry — nutrition, disease, and quality. The pure culture concept, applied in this case to "pure animal units," has opened the door to investigations in agriculture and medicine that are difficult to approach using animals carrying the usual load of microorganisms. A complicating factor in most such work under normal conditions is the modifying effect of parasites normally existing within the organism. The biologist has the opportunity to determine with greater specificity such things as the genesis of infectious diseases, the effect of antibiotics, the transformation of nutrients, and the effect of environmental sterility on meat quality.

Use of Single Contaminants

Studies already made show, for example, that additional sources of vitamins do not increase the growth of germ-free chickens significantly. Large quantities of vitamins have been demonstrated in the cecal contents of germ-free chicks, proving that vitamins in the lower region of the intestine are not necessarily of bacterial origin. When a diet capable of producing dental caries in conventional rats was fed to germ-free rats of the same strain, no lesions resulted — indicating caries in the rat is not possible in the absence of microbes.

The problem was investigated further by the use of "monocontaminants," that is, germ-free animals infected with a single pure strain of bacteria. Carious lesions were produced in every rat carrying pure enterococci infection. Lactobacilli, on the other hand, produced only a few such lesions.

Striking Difference

How does the germ-free animal compare with his contaminated counterpart in the outside world? The most striking difference is in the smell. The germ-free animal gives off no fecal or ammonia odor, and after death there is no putrefaction. The flesh of germ-free

chickens is more delicate in texture and taste than that of a commercial broiler and there is no animal odor. Germ-free mice have not shown cancers and, naturally, are not subject to infectious diseases. As regards reproduction, growth, learning ability, and adaptability to environmental changes in temperature, humidity, light, etc., the animals in the germ-free state do not differ from conventional ones.

The chief anatomical differences between germ-free and contaminated animals are found in the organs that serve as the front line defense against assault by microorganisms. The intestinal tract, for example, has a very thin wall and is shorter. The cecum is larger, with less blood supply and lacking in the lymphatic elements required for protection against invasion by bacteria. Thus, the tract is primarily a digestive tube devoid of defense functions.

Technique Used

To obtain clean animals for initiating germ-free colonies, advantage is taken of the fact that healthy animals, mammals or birds, are usually free from living contaminants before birth or hatching. It is necessary to deliver mammals by cesarotomy and to hatch birds from eggs with sterilized shell surfaces into a sterile chamber. If contamination occurs, the animals are discarded. The techniques employed to check for contamination are the usual ones and are sufficient to assure that an animal called germ-free is free from all parasites, bacteria, yeasts, fungi, and viruses.

In the early work, a simple apparatus was used. Chicks were hatched and held for periods up to 30 days in churn jars equipped with air inlet and outlet filters and sterilized in an autoclave.

Germ-free Systems

The modern germ-free system is composed of a series of autoclave-like units which can be joined in various combinations. Air filters and food can be sterilized in place, and animals can be passed from one unit of the system to another.

The Notre Dame biologists recommend a system composed of 16 raising and holding units, one operating unit, and three special examining units. The cost of such a system installed with necessary air ventilation, etc. is about $100,000. Transport and shipping units have recently been developed. Germ-free rats shipped by air from South Bend to San Francisco arrived uncontaminated. During one shipment, a litter was born, and the mother subsequently reared her germ-free offspring successfully.

At present, this country has the lead in investigations on germ-free life and stands to gain first from the fundamental and practical findings to be derived. In addition to the full-scale development of this field at Lobund Institute, established at Notre Dame in 1950, there are now laboratories at Walter Reed Army Medical Center and National Institutes of Health. Abroad, one laboratory has been established in Japan and another in Sweden, and others are being planned in Europe.

REFERENCES

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Reyniers, J. A., "Life in a Germ-free World," Cincinnati Journal of Medicine, Vol. 38, *No.* 11, *November,* 1957, *p.* 417.

Reyniers, J. A., "The Production and Use of Germ-free Animals in Experimental Biology and Medicine," American Journal of Veterinary Research, Vol. 18, *No.* 68, *July,* 1957, *p.* 678.

"HOW TO" PAINT LEAFLETS OFFERED BY DU PONT

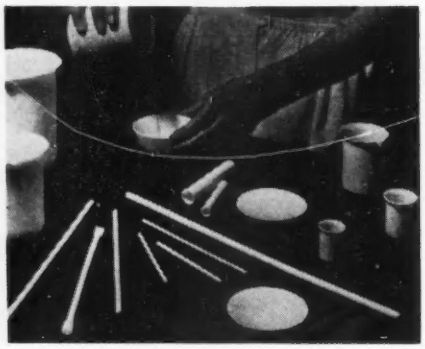
Six leaflets on painting, outlining simple procedures for achieving best results in just about every paint project that confronts a home owner, are available without cost from Du Pont. They tell how to paint houses, woodwork, floors, furniture, walls and ceilings, and metal kitchen cabinets.

The furniture brochure, for example, describes the steps recommended prior to painting, tells how to enamel, and gives the proper treatment of new and previously painted wood and metal furniture. These leaflets may be obtained without charge from: Du Pont Finishes Division, N-Annex, Wilmington 98, Del.

new PRODUCTS AND APPLICATIONS

Du Pont Acrylic Emulsion House Paint is an important development in finishes. Acrylic resins have extraordinary durability under the most severe weather conditions. The new paint lasts 50 per cent longer than conventional paints and has greater resistance to moisture blistering. A product of chemical research, the acrylic paint is reducible with water. It can be used as a topcoat over a proper primer. Its creamy consistency makes the paint easy to apply. This paint is being given limited test distribution at a price of about 10 per cent over conventional paint for similar use.

* * * * *



A beaker that pours cleanly, is non-contaminating, does not break when dropped, and is inert to corrosive or caustic solutions is one of a new family of laboratory ware made of Du Pont "Teflon" TFE-fluorocarbon resin. Because the plastic material is not wettable, liquids pour out without dribbling; sticky substances tend to release easily (its non-stickiness is what has made "Teflon" a widely used surfacing material in baking and chocolate making). Other products available are evaporating dishes, watch glasses, stirring rods, "policemen," and tubing. (Manufactured by Chemplast, Inc., East Newark, N. J.).

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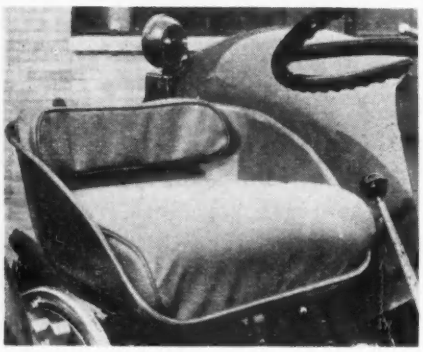


Tractor driving can be comfortable with thick, soft tractor seats of strong, light, and resilient urethane foam. After nearly two years of weathering, the urethane foam did not crumble or deteriorate. Almost five inches thick and in one molded piece, the tractor seat has excellent shock and vibration absorbing properties and offers good body support. It is covered with a washable and removable vinyl duck, and is comfortably molded to contours of the body. The Du Pont Company does not make urethane foam, but supplies "Hylene" organic isocyanates, raw material used in foam manufacturing.

* * * * *

A push-button spray is available to remove ice or frost from the windshields of trucks and automobiles. Composed of alcohol-type chemicals that lower the freezing point of water, the product is simply sprayed lightly over the windshield from an aerosol container. Within three minutes, even a 16th-inch-thick coating of ice will melt away. Du Pont developed a satisfactory formulation for this product and manufactures "Freon" propellant used to provide pressure in aerosol containers. The de-icing sprays are made by several other manufacturers.

Of interest to research and other photographers is the announcement by Du Pont that a major part of its industrial and portrait films has been converted to faster-drying, durable "Cronar" polyester photographic film base. This tough film base lies flat during all handling stages. The thin smooth polyester base eliminates optical distortion in enlargement, and there is no dimpling or distortion if film is inadvertently dried without proper removal of water drops. There is no increase in prices of films using "Cronar". The super-hardened emulsions permit high-temperature processing and drying.

* * * * *

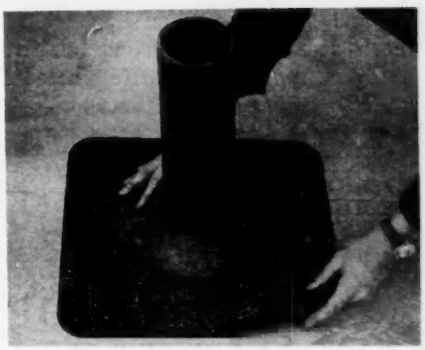
A spin-fishing line 20 per cent stronger and with one-third less stretch than standard monofilament lines, developed by Du Pont, is undergoing field tests. Trademarked "Stren", it is thinner and limper than other lines of equal breaktest, making it easy to cast longer distances with light lures. It also permits reels to hold greater amounts of line, the use of lighter sinkers, and gives less water resistance in trolling and bottom fishing. The company plans to market "Stren" monofilament spinning line in 100-yard spools in all standard sizes for fresh or salt water, from four- to 30-pounds test.

* * * * *

A new plastic cap for collapsible tubes, which enables users to squeeze the tube and spread the contents in one operation, has many potential uses in the workshop and home. A spatula of "Alathon" polyethylene resin attached to the cap spreads, scrapes, and dabs without a knife. The slick surface resists build-up, even of automotive gasket adhesives. After use, the tip is reversed and inserted in the tube opening. Because the polyethylene is tasteless and nontoxic, the cap can be used for sandwich spreads, mustard, cosmetics, and other products. (Manufactured by Stull Engraving Co., Garfield, N. J.).

* * * * *

One-piece neoprene roof vent flashings now are available to eliminate the costly sheet metal fabrications commonly used to seal vent pipes on homes and other buildings. Less expensive than conventional lead and copper flashings, the newly developed neoprene flashings feature a special double-seal collar design. Positive weather-tight joints can be made in minimum time without special tools or hot metals. Only a non-hardening caulking compound is required to complete the installation. This new type of "pre-fabricated" flashing can be used in place of all conventional materials. (Monarch Rubber Co., Hartville, Ohio).



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A unique floor finish having wear and gloss retention two to three times that of the finest varnish is being field-tested by the Du Pont Company. Among its important potential uses is the covering of concrete surfaces in such areas as dairy barns, especially where "dusting" or "spalling" is a problem. The finish dries by reaction with atmospheric moisture, thus making it suitable in damp areas. It is a clear, unpigmented, oil-free urethane — chemically related to the urethane foams used in furniture and upholstery. It is about equal in hardness and brilliance to the baked enamel on appliances.

RADIOISOTOPES: sharp eyes for research

Radioisotopes — the energy-packed, unstable atoms produced by the nation's radiation program — take on more attractive personalities almost daily.

In the laboratory, these hot elements help the agricultural chemist trace the mystery of plant life; they reveal to the chemist the mechanisms of reactions; they uncover for the researcher in chemical engineering the intricacies of reaction kinetics; they unlock some of the physiological secrets that challenge the medical researcher. In manufacturing, they chart the course of reactions previously buried deep in pipelines and pressure vessels. This ability of "tracer" isotopes to tell what is going on has permitted improvements in thousands of chemical products.

Alteration of Nucleus

Basically, these off-balance elements are formed when normal atoms are disturbed by outside radiation. Since time began, cosmic rays and other forces have done the work of disturbing and altering the nucleus of the atom. This natural process is extremely slow, of course, and radioisotopes thus formed are few and isolated. When man learned how to smash atoms he established his first reliable supply of radioisotopes. He wasted little time in putting the radioisotopes to productive use.

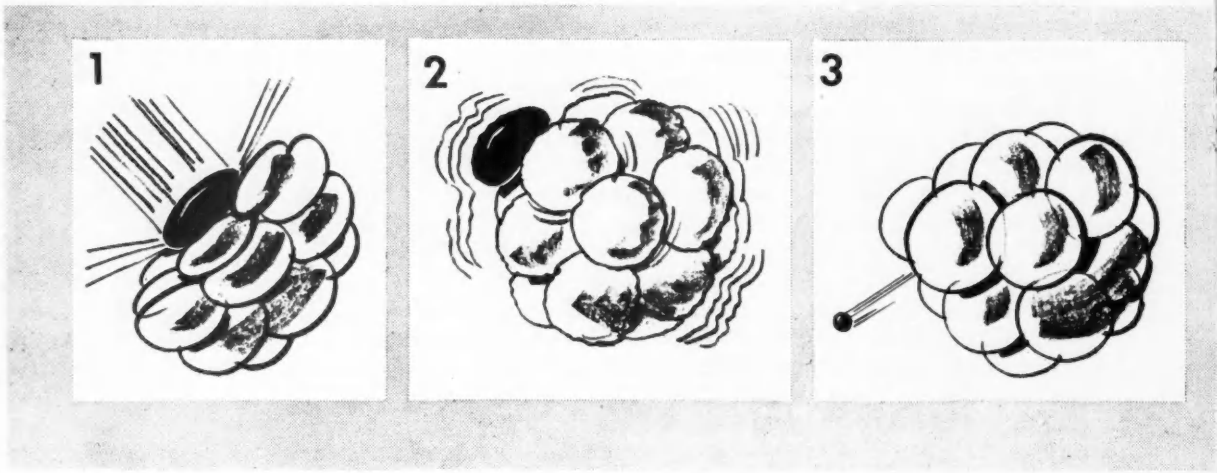
As tracers, the radioisotopes play a dual role. Since they react chemically in the same fashion as nonradioactive atoms of the same element, they enter into compounds, eliminating the danger of contaminating the process with foreign matter. But since they retain their readily identified emissions, they can be followed precisely by observers with sensitive detection instruments.

Characteristics of Isotopes

Radioisotopes produced from various elements have specific characteristics — different kinds of energy emissions, different levels of radiation, different life spans. These features permit certain and rapid identification.

When properly injected into the life process of plant or animal, the radioisotopes permit the scientist to study the chemical processes of the organism in much the same manner that "banding" makes possible the study of migration of birds and fish. "Tagged" atoms have provided new information on plant and animal nutrition, the "path" of pesticides, the manner in which chemicals and nutrients perform their function, and many other fields.

One of the most recent results of radioisotope research is the ability to detect with greater rapidity the rate of absorption, rate of elimination, and residual effect of pesticidal chemicals in animals, without the long,



1. Atomic nucleus is made radioactive by bombardment with neutron. Having no charge, neutron easily enters nucleus and is absorbed.

2. Added mass of neutron throws nucleus out of balance and it vibrates, giving off energy in the form of radiation that may . . . .

3. . . . include an electron. Radiation can be detected by scientific tools and so the radioactive atoms become tell-tale tracers.

costly, and sometimes impossible, process involved in standard chemical determinations.

"Tagged" Carbon Atoms

Carbon atoms in chemical compounds are "tagged." Analysis of the presence of tracers in various body tissues or in the exhaled CO_2 provides data on the rate of elimination. As in the case of other analytic tools, this method has definite limitations and conclusions can be reached only on the basis of careful analysis of all factors involved.

The most significant application of radioisotopes in manufacturing is in instrumentation and measurement. Because the speed and strength of the rays broadcast by a radioisotope can be calculated so exactly, the thickness and nature of materials the rays penetrate can be read with astonishing accuracy.

Accurate Measurements

Measurements accurate to five ten-thousandths of an inch, for example, are possible with a radiation source and detector arrangement used to control thickness of vinyl sheeting. The instrument furnishes the operator with accurate, quick "profiles" of the product, permitting improved quality control yield.

Instruments like this also play a part in scanning process pipes and vessels to check for interruptions in flow. Observers can measure the build-up of scale in a pipe, for example, as its opacity to radiation increases.

Use of radioisotopes in industry, including Du Pont, is expanding and will undoubtedly find application in many more problems of flow measurement, fluid analysis, and process dynamics — especially in areas where present materials or devices cannot be used.

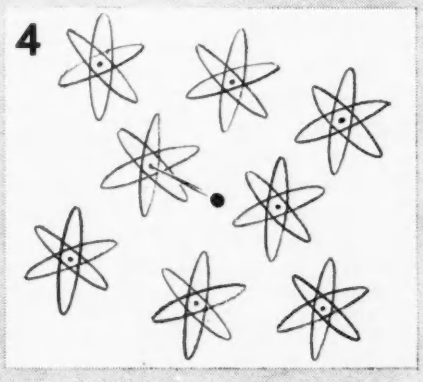
Another aspect of radiation usage — massive doses of high-energy rays — is also of continuing interest to Du Pont scientists. The story of this high-energy use is one for the future in terms of industrial application, but it's very much a present activity for the men in many company laboratories.

High-Energy Radiation Research

Du Pont's Central Research Department, one of the first industrial groups to experiment with high-energy radiation in chemical research, is examining its effect on chemical reactions. High-energy bombardment may reduce contamination in some products, produce familiar materials by new routes, modify the properties of many existing products or lead to entirely new ones.

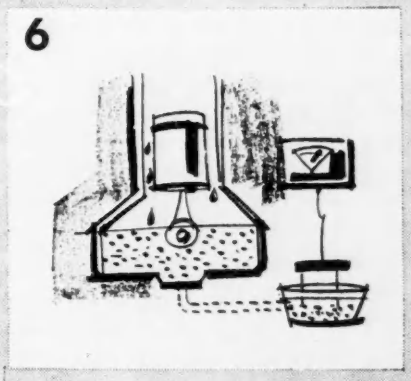
To study radiation's effect on reactions, Du Pont's Engineering Department recently opened a Radiation Physics Laboratory. Here massive accelerators and detecting equipment can record what happens inside a material when it is peppered by electrons. Other departments in the company are probing the effects of radiation on man-made fibers, plastics, films, and scores of other well-known products.

In short, this force that modifies atoms with such speed promises to rearrange our future as well.



4. When the radioactive atom enters chemical reaction with chemically identical nonradioactive atoms, it "broadcasts" its location.

5. In the life stream of plant and animals, location of radioactive atoms provides information on process of growth and disease.



6. Particles of "hot" metal worn off machinery can be "counted," giving an accurate measurement for minute wearing of its surfaces,

NEW DU PONT FILM FOR GREENHOUSES

DURABILITY and low cost of greenhouses using Weatherable "Mylar" film make them practical for the home gardener.

With years of research and performance testing behind it, a long-life plastic film for practical and economical greenhouse construction has been introduced commercially by Du Pont. The new form — designated Weatherable "Mylar" polyester film Type W — is a modification of standard "Mylar" which adds outdoor durability to the material's great strength, full transparency, and resistance to temperature extremes from 60°F below zero to 200° above.

One-Third of Cost

Exposed outdoors at 45° facing south (the most adverse condition), the new film in its recommended five-mil thickness will last at least three winters and two summers; on vertical surfaces, at least five years.

Using Weatherable "Mylar", a greenhouse can be erected for approximately one-third the cost of the usual glass structure, and studies indicate it will be substantially cheaper than ordinary films since frequent replacement will not be necessary. Wide use of the material for other glazing purposes, particularly for agricultural uses, is also foreseen. It has given excellent results on cold frames, in poultry houses, and similar buildings.

Resistance to Weathering

Weatherable "Mylar" has been tested in the laboratory, as well as under actual exposure conditions in Florida and in at least 15 greenhouse installations throughout the country. The houses built have ranged from a 12-by 18-foot home garden installation (Wilmington, Del.) to an 18- by 145-foot structure for a professional grower (Hanover, N. J.). Ten have been erected at universities where their performance has been closely studied by agricultural specialists. After two years' severe exposure, the film still had properties superior to those of many unexposed films.

Structural performance of the greenhouses using Weatherable "Mylar" has been completely satisfactory in every case. Some houses have been subject to 70-mile winds and heavy snow loads, with no damage.

Since "Mylar" Type W can be fitted tightly and smoothly and does not shrink or stretch, greenhouses using it have an excellent appearance. When properly installed, the film resists tearing and does not buckle or bag. With its high impact strength, it is less susceptible to hail damage than glass.

Strongest Plastic Film

"Mylar" is the strongest of all plastic films with a tensile strength of 17,000-25,000 pounds per square inch. Other aspects of its physical toughness — tear strength, bursting strength, impact strength, elongation, and flex life — are sufficiently high to ensure excellent resistance to mechanical damage. Laboratory studies and field experience both show that the film on properly built structures can withstand 75-mile winds and heavy snow loads.

Moisture absorption by the film is practically negligible — less than 0.3 per cent when immersed in water at 25° C. for one week. Physical and mechanical properties of "Mylar",

therefore, remain essentially constant over the entire range of relative humidity.

"Mylar" has a relatively high degree of impermeability to water vapor — about the same as that of polyethylene film. It is highly resistant to attack by fungi and bacteria. Samples buried in bacteria infested soil for twelve months were not affected, whereas treated cotton under the same test conditions failed in about 14 days.

Weather extremes do not change the properties of Weatherable "Mylar" polyester film Type W. The film does not become brittle in the coldest weather, nor does it contract or expand with temperature extremes in any degree which would affect a greenhouse application. Maximum temperature for continuous exposure has been established as 200° F.

No plasticizer is present in "Mylar", with the result that embrittlement through plasticizer loss cannot occur as it does with some films. Weatherable "Mylar" polyester film Type W has physical and chemical properties iuentical to those of standard "Mylar," with the exception of light transmission.

Fine Plant Growth

Both forms of the film transmit light in essentially the same manner as window glass except that Weatherable "Mylar" Type W differs in the ultraviolet region. Window glass will transmit in the range between 3200 and 3900 Angstrom units; "Mylar" Type W will not. It is not considered that this factor adversely affects plant growth.

Plants show fine growth under Weatherable "Mylar", according to all reports, including that of Dr. E. M. Emmert, Department of Horticulture, University of Kentucky, a recognized authority who has studied plastic greenhouses for many years. Dr. Emmert has described greenhouses of Weatherable "Mylar" as one of the "best methods for economically growing all kinds of plants."

LARGE greenhouses use 2 x 2 framing.

Greenhouses built with Weatherable "Mylar" offer great savings because only a light and relatively simple basic structure is required. Framing is usually done with two-by-fours and two-by-twos, this light construction requiring only minimum foundations. The usual supports for glass panes are not needed, and the laborious glazing process is greatly simplified. Structures using plastic film can be simply designed and erected without the need for highly skilled labor.

Maintenance at Minimum

Annual maintenance costs are at a minimum, particularly in comparison with glass structures which frequently require reputtying and repainting. The usual equipment for heating and ventilating can be used in greenhouses without difficulty.

Properly constructed greenhouses using Weatherable "Mylar" are tighter than most glass houses, an advantage particularly when forced ventilation and humidity control are used during warm weather. Under normal conditions humidity does not build up quite as much as it does under other film.

Suggested plans for greenhouse construction are available from some of the film distributors who will handle all sales of Weatherable "Mylar". The basic structure usually follows conventional lines using two-by-fours and two-by-twos on 20-inch centers. The film is fastened to the framing, using nail-down strips. A one-inch or two-inch overlap is used.

Attractive Appearance

The need for stretching the film tight as it is applied is the only special construction precaution. This not only ensures that the film will resist damage but also produces the attractive appearance of a well-built structure.

Standard "Mylar" is not recommended for outdoor use since it does not have the resistance of the weatherable form to outdoor exposure. Weatherable "Mylar" Type W is identified as such by a label printed along the edge of the film. Weatherable "Mylar" polyester film Type W is at the present time available only in a thickness of five mils (0.005 inch).

STAPLES temporarily fasten "Mylar" film.

ZINEB CONTROL OF ASPARAGUS RUST

Experiments were carried out over a two-year period to determine which of four fungicides would give best control of asparagus rust. The experimental areas consisted of portions of a 240-acre asparagus field of the Robert's strain, Mary Washington variety. Zineb* was superior to the other chemicals tested. These data also confirm other findings with respect to the superiority of zineb. Even though infection was more severe in the end of the plots nearer the adjoining severely affected field, a relatively higher degree of control was obtained with zineb. Eight applications of zineb gave a significantly greater control than did four or six treatments. Again, somewhat better control was obtained at the west end of the field. It is likely that control would have been better had the first application been made one week earlier or before the initial appearance of urediospores. — DEPARTMENT OF HORTICULTURE, UNIVERSITY OF ILLINOIS.

**Du Pont manufactures zineb fungicide under the trademark, "Parzate".*

SPLIT NITROGEN BOOST RICE YIELDS

Rice farmers may benefit from late, split applications of nitrogen on water on continuously flooded fields. In 1956, 100 pounds of urea per acre were applied 45 days after seeding and another 100 pounds 85 days after seeding. This plot produced as much rice as one receiving 300 pounds of urea 45 days after seeding. A 1957 comparison shows a late, split application of 90 pounds produced higher yields than a single 90-pound application. The data suggest a probable advantage in applying part of the nitrogen fertilizer on rice near the early boot stage — 70 to 85 days after seeding — where the fertilizer must be top-dressed on water. On drained fields, however, a single application of nitrogen gave higher yields. — AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF ARKANSAS.

IMPROVED PEANUT PRACTICES

Tests in 1957 demonstrated the advantage of planting recommended varieties and using improved cultural practices in peanut production. Using recommended varieties in place of commmon seed resulted in a 15-per cent increase in yield and an additional $12 per acre. Using improved cultural practices such as seed treatment, weed and pest control measures, recommended rates of planting, seed size, and methods of cultivation resulted in a 30 per cent increase in yields and an extra $24 per acre. — AGRICULTURAL EXPERIMENT STATION, OKLAHOMA STATE UNIVERSITY.

PEANUT SEED TREATMENT

The need for better chemicals for treating seed, particularly peanuts, has been demonstrated. In 1957 tests, seed treated with "Arasan"* 75 thiram seed disinfectant produced better stands than seed treated with other chemicals. In the future, "Arasan" 75 will be used as a standard by which to compare newer materials. — AGRICULTURAL EXPERIMENT STATION, OKLAHOMA STATE UNIVERSITY.

**Du Pont trademark.*

GUNS AND AMMUNITION INFORMATION

Remington Arms Company, Inc., is offering an illustrated catalog of its products for hunters and shooters which is more than just a descriptive price list. It contains information on shotgun barrel lengths and chokes, comparative shot size chart, recommended loads for big game species, tables on rifle and pistol cartridges, and other data of interest to sportsmen. For a free copy, write: Advertising Division, Remington Arms Company, Inc., Bridgeport, Conn.

LIQUID SUSPENSION OF "ARASAN" DEVELOPED

The first commercial liquid suspension of thiram has been developed by the Du Pont Company. "Arasan" 42-S seed disinfectant and protectant marks a major accomplishment in more than three decades of research and development with seed treatment chemicals. The new product offers the safety and fungicidal efficiency of thiram, plus the convenience and advantages of liquid formulation. It is intended for use as a slurry treatment of seed and as paint or spray repellent of rodents, rabbits, deer, and birds.

Particles Adhere Tightly

The liquid formulation — which contains four pounds of active material per gallon — is a stable suspension of extremely fine particles of thiram and can be used wherever slurry treatment with "Arasan" is recommended. It is easy to measure and disperses almost instantaneously in water. The fine particles adhere tightly and uniformly to the seed without dusting off, thus providing thorough, even coverage for maximum protection and uniform flow of seed through planting equipment.

Of significance in the use of thiram as a repellent for treatment of nursery stock, fruit trees, and forest seedlings is that its natural sticking qualities eliminate the need for an adhesive agent when used undiluted.

For slurry treatment "Arasan" 42-S is used at rates from 2.75 pints to 11 pints per gallon of water.

PLASTIC FILM FOR SILAGE

One method of obtaining silage with greater feed value is to use a plastic film over a bunker silo. Overlapping plastic strips covered with sawdust keep leaching and spoilage loss at a minimum. The use of 10½-foot-wide strips of plastic over the bunker silo seems to offer several advantages to farmers. The strips are easier to handle than large sheets and may be removed one at a time, leaving the remainder of the silo sealed. Only a little over one per cent of the dry matter was lost through spoilage. — WESTERN WASHINGTON EXPERIMENT STATION.

FERTILIZER AIDS SEEDCOTTON YIELD

In outlying cotton fertilizer tests at 10 locations during two years, yields of seedcotton were significantly increased by fertilizer in 10 of the 12 trials that included major nutrient treatments — N, P, and K. Nitrogen alone increased yields in nine of the tests. Highest yields generally occurred where N was applied at 60 pounds an acre. Yields rose further with 90 and 120 pounds on heavy clay soil. Applications of more than 60 pounds of N, with or without P and K, delayed maturity and produced excessive vegetative growth on medium and coarse-textured soils where moisture was adequate. At 60 pounds, with P and K as needed, yields generally increased. All treatments tended to hasten maturity on heavy clay soils. — AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF ARKANSAS.

PLASTIC BAGS FOR MARKETING CREAM

Recent research shows that the use of plastic bags, rather than cans, for marketing cream improves the quality of the cream, decreases overhead costs at the creamery, saves shipping space and weight, and permits the use of smaller and less expensive trucks. Four ten-pound bags hold the equivalent of a five-gallon cream can but take up only half as much space. The weight of the empty bags and corrugated paper box in which they are shipped is 2.5 pounds, compared with 14 pounds for the average empty five-gallon can. Plastic bags eliminate washing and handling of cans at the creamery which, in turn, means less equipment, supplies and labor are required. —SOUTH DAKOTA STATE COLLEGE.

BLIGHT CONTROL IN AZALEAS

Outstanding results were obtained for petal-blight control with "Thylate"* thiram fungicide in the first field test, which included only materials chosen after several years of testing. "Thylate" appeared to give even better control than nabam or zineb. It is easier and more pleasant to handle, is reasonably safe around the home, and the residue is difficult to detect on blossoms. Only two applications were necessary to achieve control. — AGRICULTURAL EXPERIMENT STATION, MISSISSIPPI STATE COLLEGE.

**Du Pont trademark.*

by raising productivity

TECHNICAL ADVANCES CUT FARMER'S WORKWEEK

A continuing decline in the hours of work on U. S. farms is rapidly narrowing the traditional gap between the standard workweek of the industrial and agricultural worker. In 1956, the average number of hours worked in agriculture had dropped to 47 per week, compared to 40.9 for the non-farm sector, according to a study by the Department of Labor.*

The length of the workweek is basic to any assessment of a nation's living standards. Relating the amount of goods produced to the amount of work required measures the economy's productivity and, of course, offers an evaluation of the investment of productive tools. Leisure, like goods and services, is purchased with working time. Only after basic necessities are produced can the individual elect leisure as part of the reward for labor.

Workweek Sharply Reduced

Although the trend has not been consistent, the workweek in agriculture during the past 100 years has been sharply reduced. The workweek in industry, where technology was earlier and more intensively applied, has dropped even faster. In both agricultural and non-farm enterprises, the decline has been most rapid in the 20th century. From 1850 to 1900, the workweek in non-agricultural industries dropped from 66 to 56 hours, but in the next 40 years, the decline averaged four years per decade, reaching 41 hours in 1940. The agricultural workweek went from 72 hours to 65 between 1850 and 1910. The farm workweek reached 55 hours in 1930.

Difference Declining

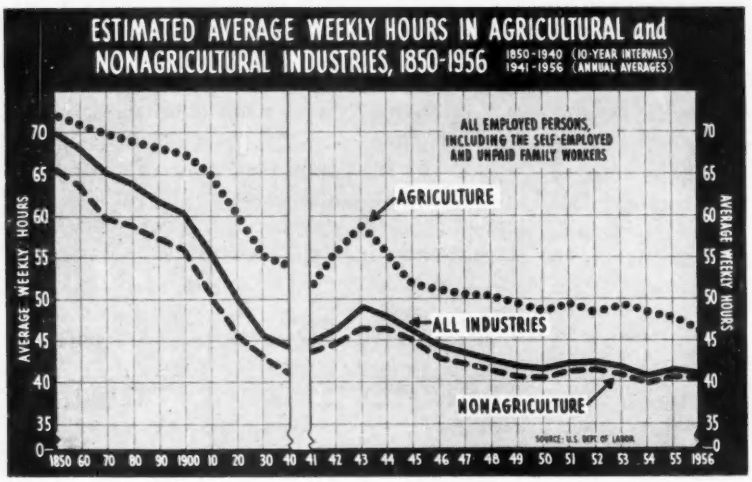
During World War II, hours in all fields rose again. Reduction was resumed after the war, going down more rapidly in agriculture than in other industries, where the 40-hour week had become fairly standard prior to the war. Thus, the difference between the agricultural and non-agricultural work is being whittled down. In 1850, that difference was five hours. Since industrial hours of work declined more rapidly, the gap widened, reaching about 12 hours in 1940. But between 1947 and 1956, the average farm workweek declined by another four hours, compared to only 1.4 hours in non-agricultural pursuits.

There are, of course, wide differences in the hours worked by individual farmers and farm workers. Self-employed farmers have generally worked longer hours than "hired hands."

Economic differences, including mechanization, quantity or quality of land, type of farm, skill, all make for differences in the workweek. These differences do not, in any event, negate the significance of the national average.

As mechanization and its resultant rise in productivity continue on the farm, the trend towards a more restricted workweek may continue. As pointed out by the Department of Labor, "it is not at all clear," however, that the ability of individuals to afford more leisure — as opposed to goods and services — "will be translated into demand for more leisure. The recent rapid rise in dual job holding has occurred during a period of near full employment."

*Zeisel, J. S., "*The Workweek in American Industry*," Monthly Labor Review, Vol. 81, No. 1, January 1958, p. 23.*



Cost of Methionine Supplementation Reduced

A new Du Pont Company product, "Hylan" feed supplement, offers manufacturers a 40 per cent reduction in the cost of methionine supplementation of broiler, layer, and turkey feeds. This results from a more economical manufacturing process for methionine hydroxy analogue calcium, the methionine component of "Hydan". Availability of methionine at this price is the latest significant step in Du Pont's $10,000,000 program of research and commercial development of this amino acid.

Second Methionine Source

The present-day broad use of synthetic methionine sources has come about almost entirely since the commercial introduction of Du Pont DL-methionine in 1952. A second source, methionine hydroxy analogue calcium, was added in 1957. The synthetic analogue of methionine is an efficient source of this essential amino acid. Where methionine is the only major deficiency in otherwise well-balanced rations, both "Hydan" and the amino compound, DL-methionine, improve the amino acid balance of the protein. Research also indicates that analogue preparations of methionine are more easily metabolized by poultry than DL-methionine.

Higher-Energy Rations

The practical value of this research and the commercial value of Du Pont methionine come from the modern trend toward higher energy rations for poultry feeding. Methionine is one critical nutrient which is most likely to become deficient as calorie content is increased. Du Pont studies provide the means for calculating the extent to which a given ration must be supplemented with methionine. Sources of energy and protein are the most expensive portion of commercial rations, so a proper balance between the two can provide maximum feed efficiency at minimum cost.

The Du Pont Company is continuing its studies of amino acid nutrition, and expects to provide American agriculture with other essential amino acids at economic price levels as the need for them develops in the advancement of nutritional science and in increasing agricultural technology and farm production efficiency.

Food Radiation Begun at DuPont-Operated Atomic Plant

Fresh meat that can sit on the pantry shelf without spoiling or go along with troops to remote battlefields without refrigeration is one of the expected results of radiation work recently undertaken at the Savannah River Plant of the U. S. Atomic Energy Commission. Food preservation by radiation, which may also help cut down the cost of shipping, processing, and marketing, is only one phase of atomic study going on at the nation's vast atomic plant, near Aiken, S. C., designed, built, and operated by the Du Pont Company.

Material Used In Research

Although, of necessity, most of the activity and output is of a secret military nature, peacetime contributions have also come from Savannah River. Studies on atomic structure, the behavior of atomic particles, and the effect of radiation on plants and other materials have either been made at Savannah or have been carried out elsewhere with materials produced in its plant.

Savannah River is the nation's prime producer of heavy water, a basic ingredient in some atomic research, installations, and in atomic power plants. Another product is radioactive cobalt, important in treatment of cancer because of its highly penetrating radiation.

One-Dollar Fee

Du Pont's work with atomic energy goes back to World War II, when the company was asked to build the wartime atomic plant at Hanford, Wash. Du Pont's fee for the Hanford operation — and for Savannah River, as well — was $1 and all patents developed belong to the government. In 1950, when U. S. defenses were being reinforced, the Atomic Energy Commission urgently asked Du Pont to build another plant. Hundreds of technical people were assigned to the task of building and operating one of the largest industrial projects ever undertaken in relatively uncharted fields. The Du Pont Company also operated the Dana, Ind., atomic plant, where heavy water was made, before it was put on a standby basis last year.

case history in chemurgy

SAFFLOWER OIL FINDS WIDE USE IN PAINT

Oil pressed from thistle seed that once fueled the lamps of ancient Egypt is today becoming an important ingredient in high-quality paint. As a result of this development in chemurgy, some 170,000 acres of land in California, Utah, and Idaho are growing a profitable crop: safflower (Carthamus tinctorius L.).

Safflower is one of the few crops introduced to American agriculture for a chemurgic market. Generally chemurgic markets are sought for surplus crops or "by-products" of crops grown for other purposes. But safflower has come into a strong economic position because its oil fills a definite industrial need. Contract acreages provide a dependable supply for the buyer and a dependable market for the grower. The product keeps well enough so that a plant depending on it can operate the year round. It is uniform enough to satisfy the requirements of industry, and can be supplied where needed without excessive shipping costs.

Du Pont Paint Research

Chemurgy of safflower seed originated in work done at the College of Agriculture, University of Nebraska. In 1950, commercial development was undertaken which eventually indicated that the oil might have qualities useful in paint manufacture, pharmacology, and foodstuffs. The Du Pont Company made a study of safflower oil at its paint research laboratory which has resulted in improved paint formulations, particularly of white paint. Safflower oil makes whiter paint, both in the package and upon application, than other oils, and gives a heavier film on the painted surface without "wrinkling."

As a result of these tests, and the availability of a supply of safflower oil from contract acreages, plants of Du Pont's Fabrics and Finishes Department have been producing increasing quantities of "outside white" house paint containing safflower oil during the past year. The acreage is not under contract directly to Du Pont, but is contracted by a processing firm. This is one more example of teamwork in the American economy, with enterprises of various size — farmer, processor, and Du Pont — each performing the function for which it is best equipped.

From the grower standpoint, substantial production began in 1955 and 1956, with an oil output of some 750 tank cars. Most production during this period was in the Sacramento Valley of California. Further research and development of higher-yield species has extended growing to some of the semi-arid areas of Idaho and Utah. There is a possibility that greatly expanded use will make it a competitive crop in the Great Plains. Production for 1958 is estimated at twice the previous year, about 1500 tank cars of oil or some 110,000 tons of seed.

Good Financial Return

A study by the Utah Experiment Station showed that the average farmer who used his diverted dry acres to grow safflower in 1957 "made going wages and his expenses, plus interest on his money." Total cost of production — including seed, fertilizer, labor, use of machinery, and interest — was found to be $18.05 per acre, with total net return at $18.13. Yield varied from 133 to 1200 pounds of seed per acre, averaging 516.*

Cultivated safflower is a member of the thistle family. There are some 25 wild species, found on all five continents. The seed and its oil have been used for centuries as oil and food in Europe, India, and Japan. Ancient Egyptians burned the oil for light and the Chinese have made scarlet dye from its flower. Oil content varies among species. Cultivated safflower showed oil content from 30 to 36 per cent in a study at the University of California, compared to 16 to 21 per cent for one of the wild species found in the State.†

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*Morrison, E. M. and Withers, Russell V., "Pioneering a New Crop," Farm And Home Science, March, 1958, p. 13.

†Knowles, P. F. and Ashri, Amram, "Wild Safflower in California," California Agriculture, April, 1958, p. 4.

Farmers Ask About . . . .

Q: Is farmer-ownership of farm land decreasing?

A: On the contrary, farmers bought 55 per cent of farms sold by non-farmers in 1956.

* * * * *

Q: Can weather be predicted a year in advance?

A: "Applied climatology" provides a new method of statistical analysis of long-period weather trends which provides reasonably accurate future weather information on the basis of past trends.

* * * * *

Q: What injury is caused by the peach tree borer?

A: It tunnels and feeds just under the bark in the trunk, usually below the soil line. The cambium and phloem layers are partly destroyed.

* * * * *

Q: When was the alfalfa weevil first discovered in the East?

A: During 1951 in Maryland. It is now a serious pest in the Mid-Atlantic states.

* * * * *

Q: How true is the claim that horned lizards can squirt blood from the eye?

A: It happens when alarm or excitement causes the sinus at the corner of the eye to rupture.

* * * * *

Q: Can plant viruses pass through dead tissue?

A: In USDA experiments, southern bean mosaic virus infection passed from living cells through steamed sections of stems.

* * * * *

Q: What is "Pfeffingerkrankheit?"

A: A cherry tree disease found in Central Europe. It is believed to be the disease designated as "Rosette" in the U. S.

* * * * *

Q: Is the castor bean plant poisonous to insects?

A: Although poisonous to man and livestock, it is not toxic to insects.

Q: Has processing increased vegetable consumption?

A: Apparently, since the 20-per cent per capita increase in the past 15 years is almost all in processed vegetables.

* * * * *

Q: Does the woodpecker injure fruits?

A: Although it sometimes eats fruits, the red-bellied woodpecker's diet consists mostly of injurious forest insects.

* * * * *

Q: How serious is weed and brush in grazing lands?

A: In the 11 western states, most of the 536 million acres of grazing land are infested.

* * * * *

Q: What is the best way of detecting insect infestation of grain?

A: Although presence of emergence holes or insect damage shows infestation, X-ray detection is most accurate.

* * * * *

Q: How much of the cost of the national product is made up of taxes?

A: According to the Agriculture Department, taxes represent more than one-fifth of the value of all goods and services produced in the U. S.

* * * * *

Q: Have farmers' receipts from farm products kept pace with personal income in recent years?

A: They are ahead: U. S. total personal income is 3.5 times the 1940 level, but receipts from sale of food products, almost 4.5 times.

* * * * *

Q: What is Du Pont's net return on its operating investment?

A: Eleven per cent in 1957.

* * * * *

Q: How many people own stock in U. S. corporations?

A: Over 10 million individuals, according to a N. Y. Stock Exchange survey, with many more indirect owners through savings accounts, mutual funds, insurance policies, and institution investments.

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